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Newman

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[54] **TRENCHING EQUIPMENT WITH HINGED SIDE PLATES**

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[22] Filed: **Sep. 20, 1985**

[51] **Int. Cl.**[4] **E02F 5/02**

[52] **U.S. Cl.** **37/103;** 37/DIG. 16

[58] **Field of Search** ..... 37/103, 117.5, DIG. 16, 37/71, 80 A; 405/180-182

[56] **References Cited**

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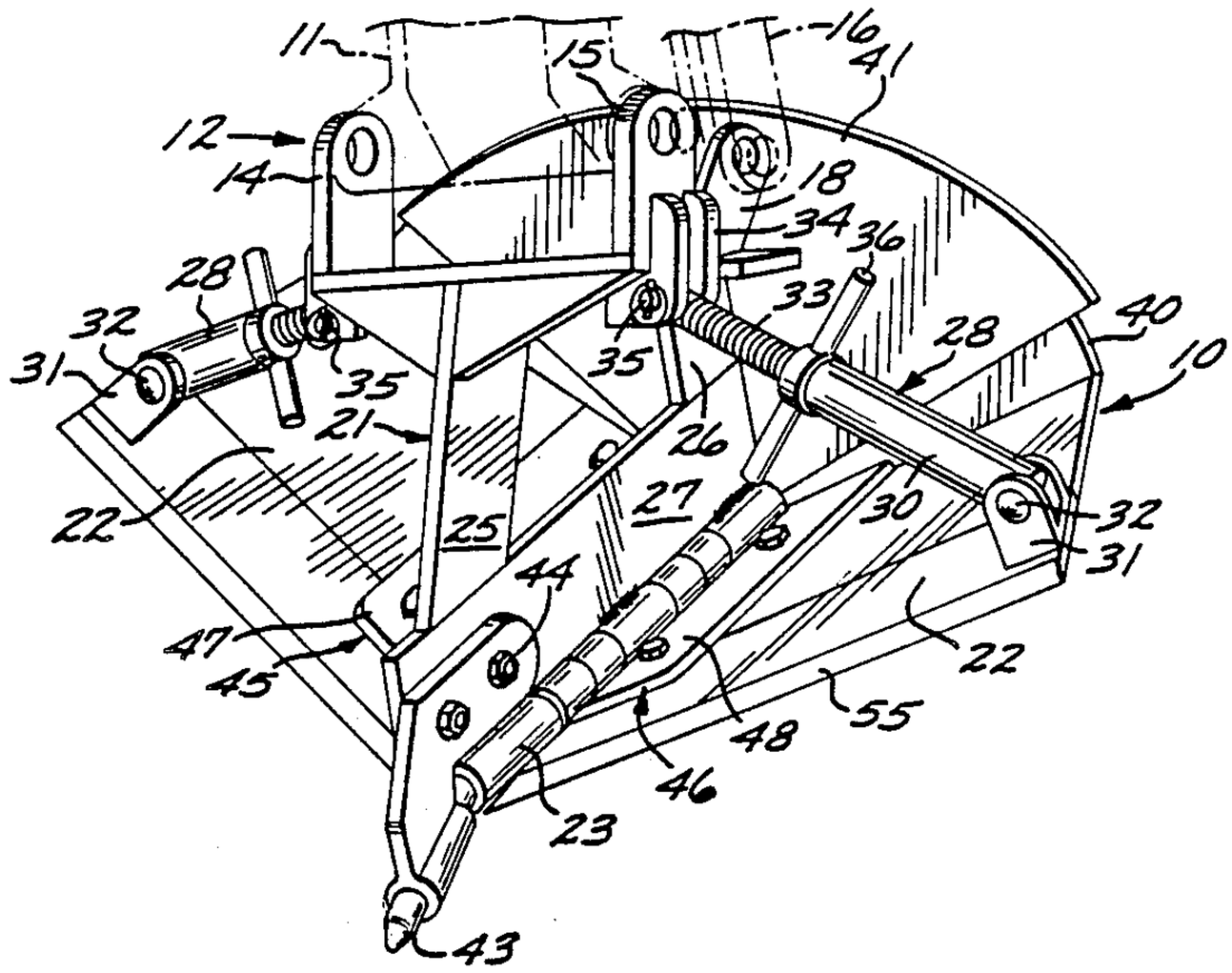
Attorney, Agent, or Firm—Fulwider, Patton, Rieber, Lee & Utecht

[57] **ABSTRACT**

This invention relates to an improved trenching bucket for use with trenching equipment such as backhoes, wherein the side plates of the bucket are adjustable so that trenches can be formed with walls at various slopes.

9 Claims, 12 Drawing Figures



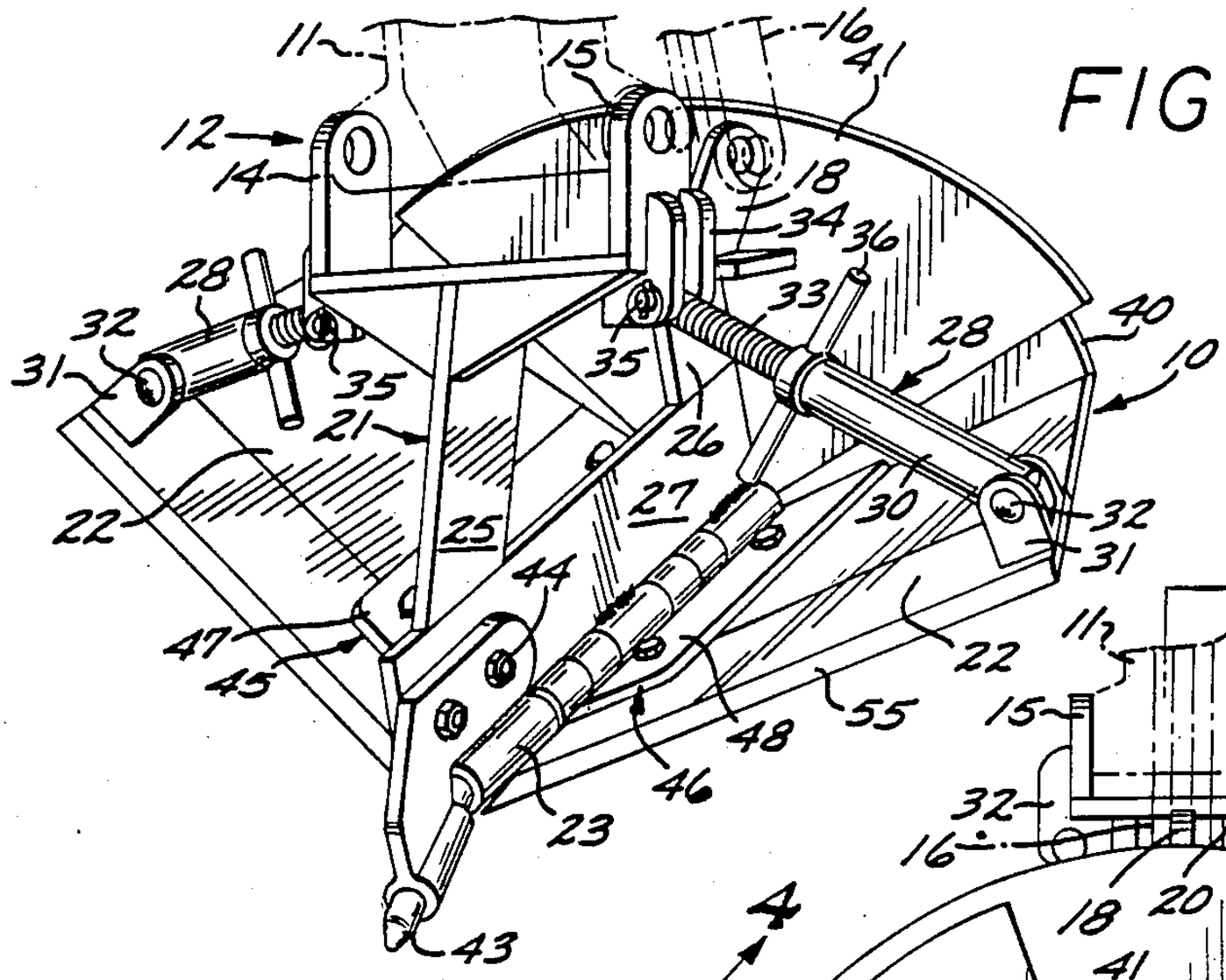


FIG. 1

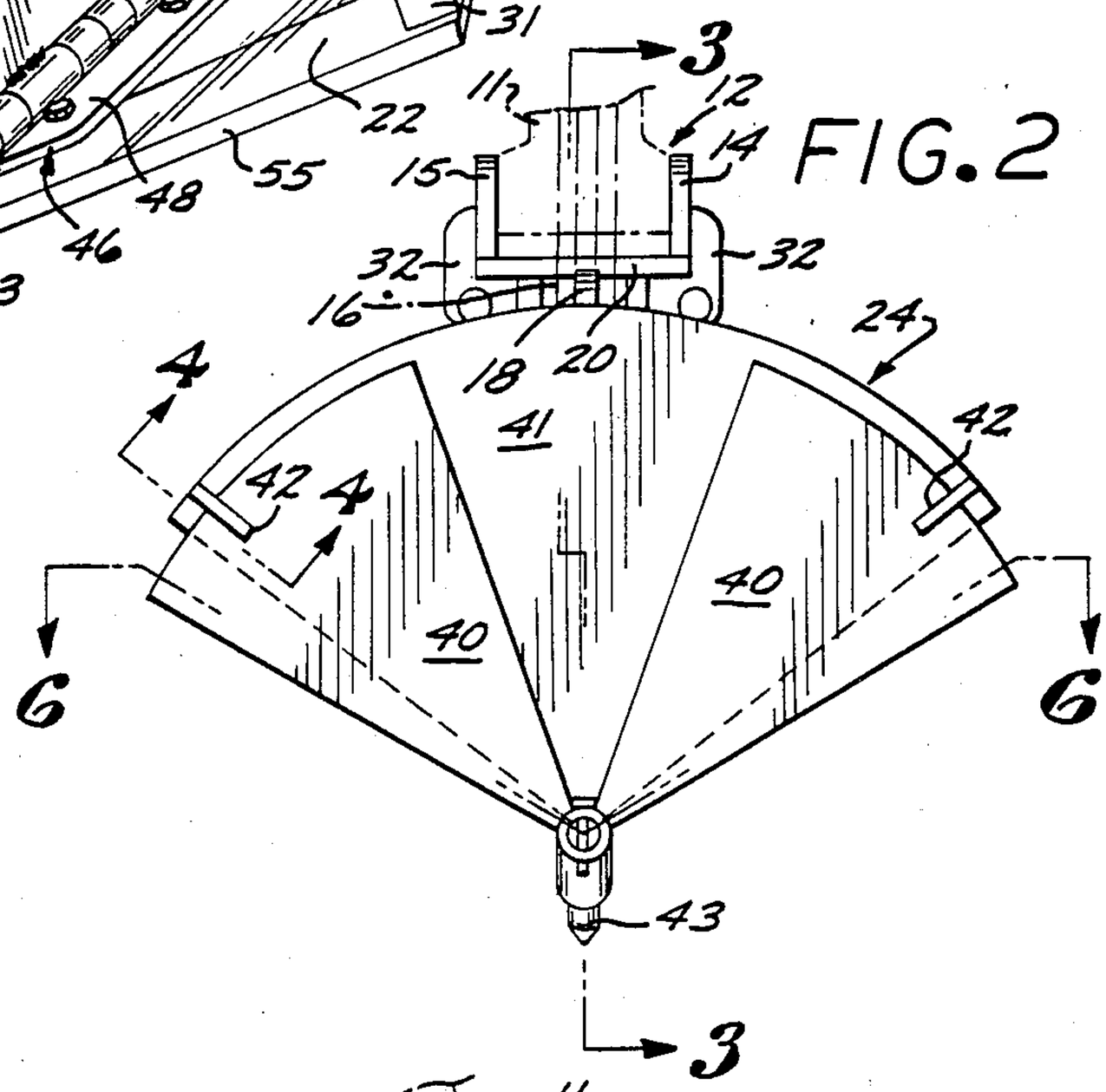


FIG. 2

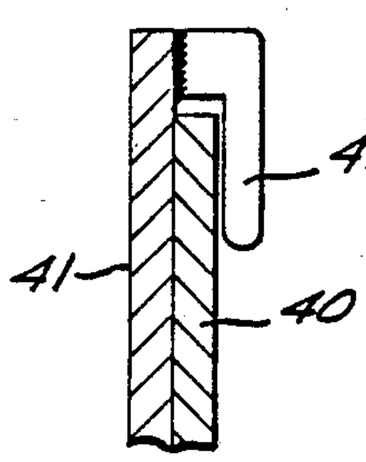


FIG. 4

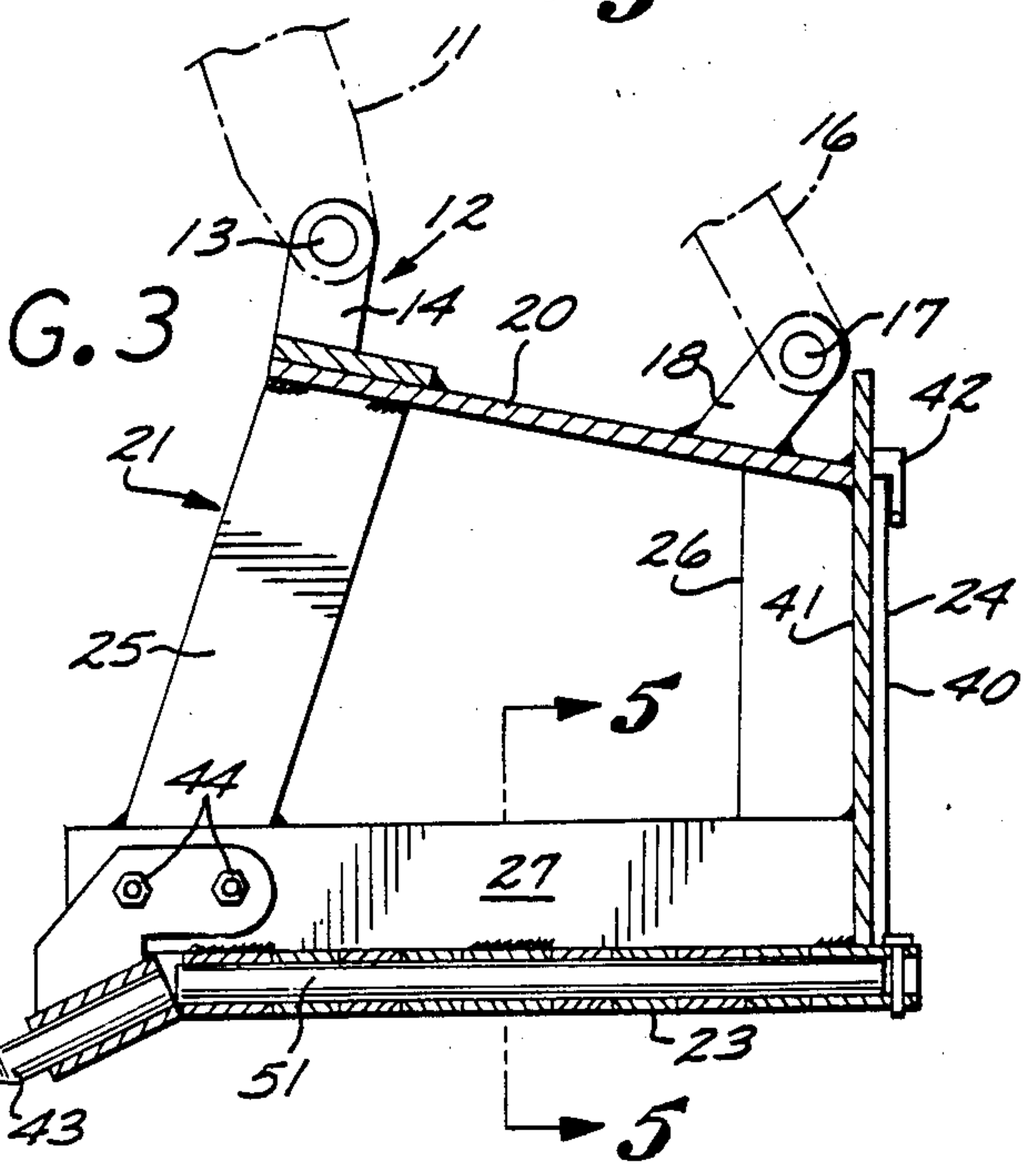


FIG. 3

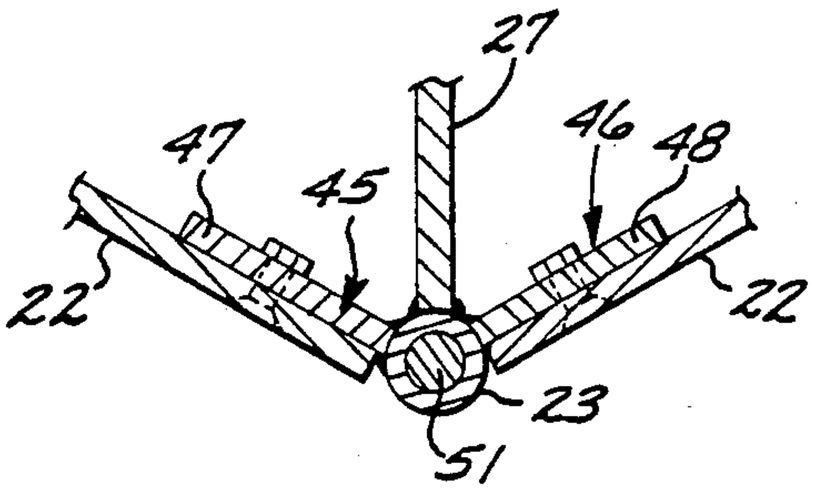


FIG. 5

FIG. 6

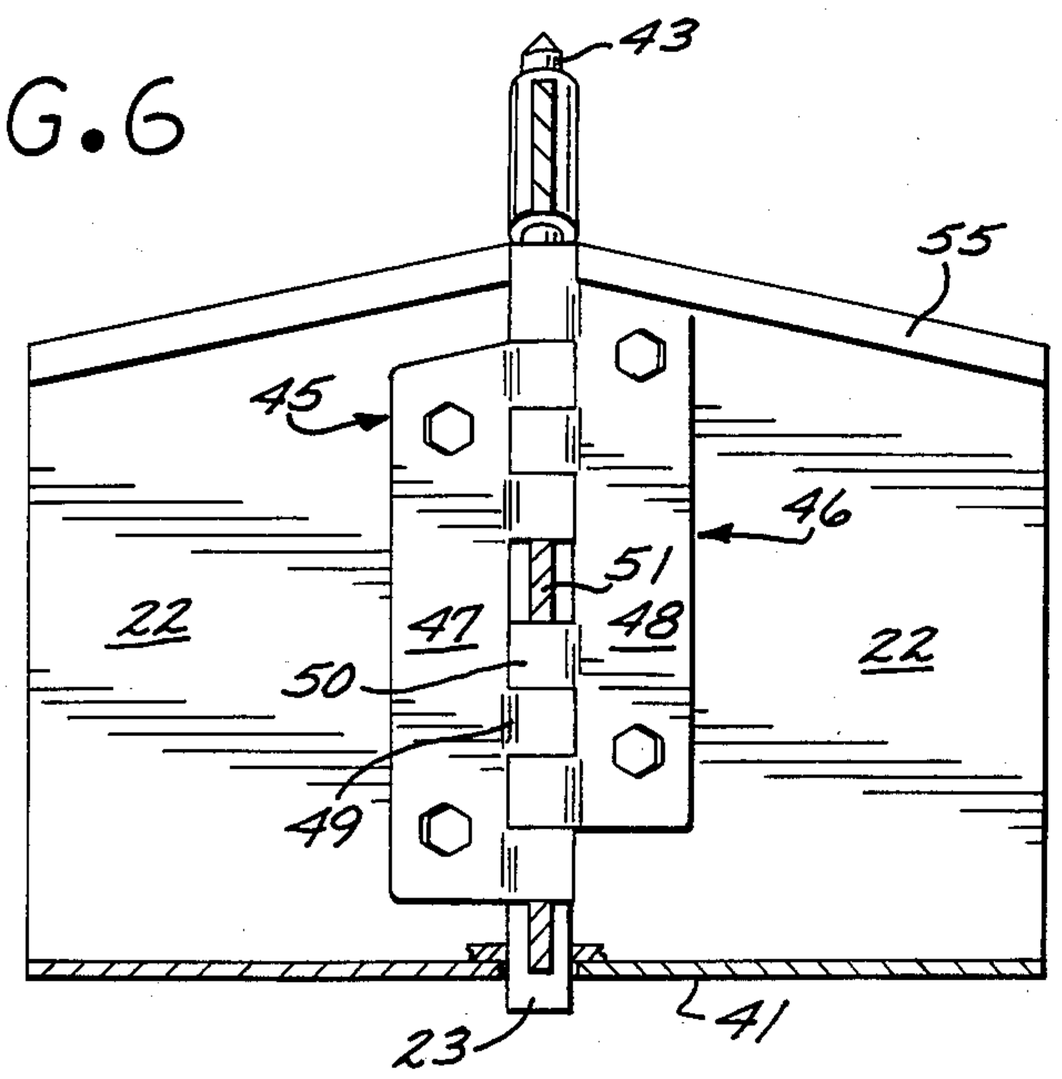


FIG. 7

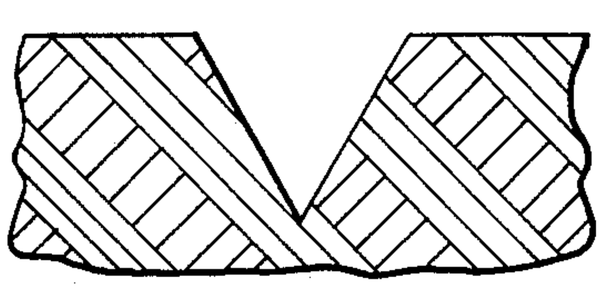


FIG. 8

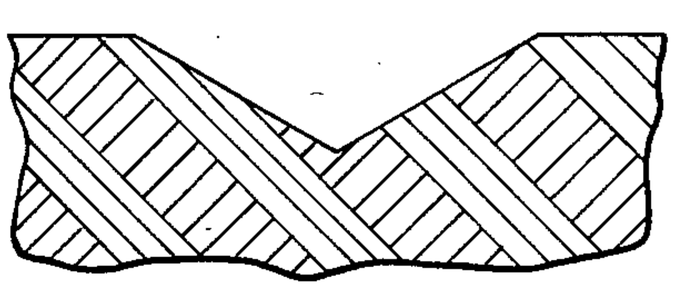


FIG. 11

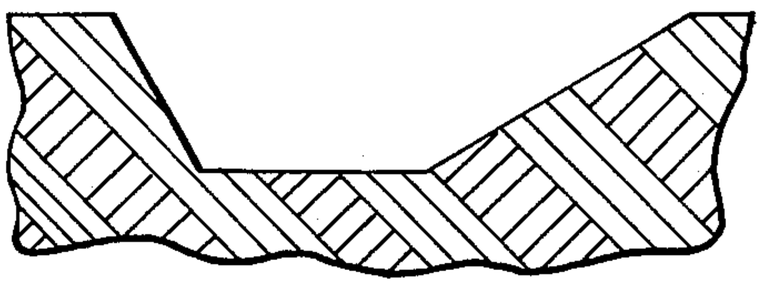


FIG. 12

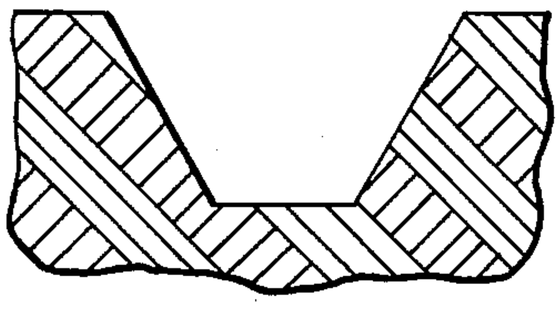
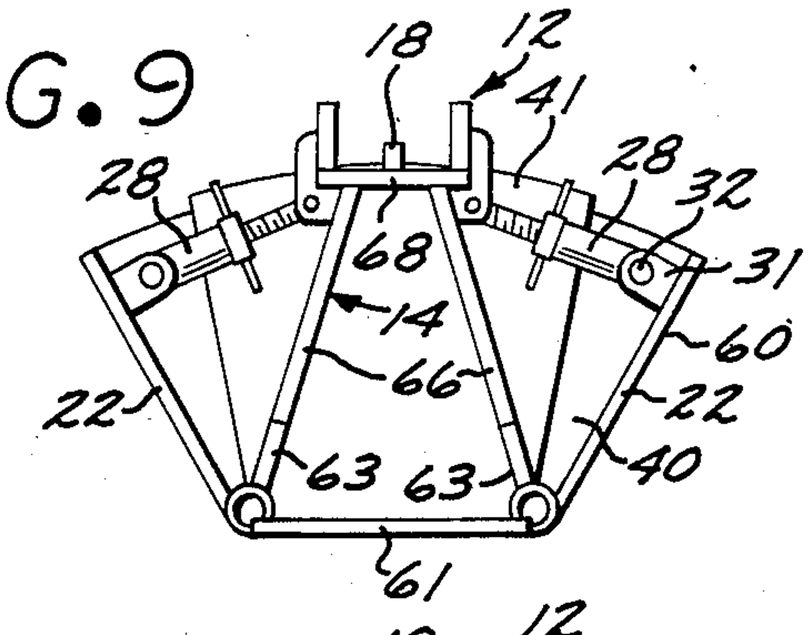


FIG. 9



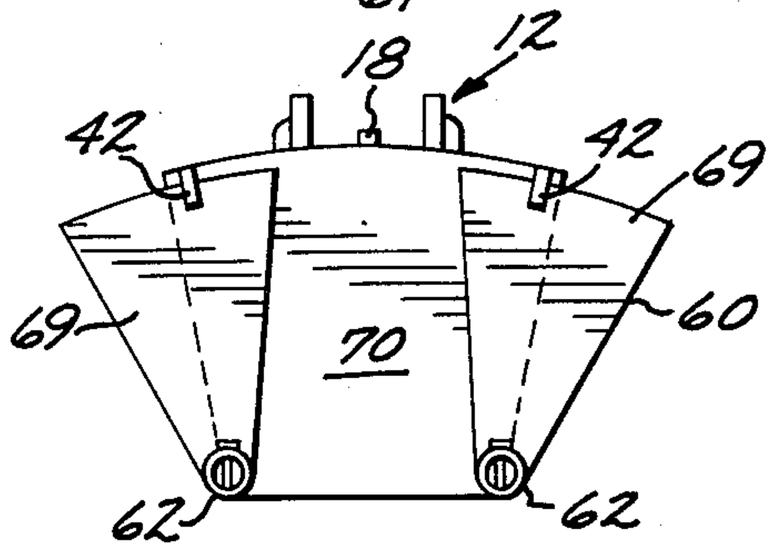


FIG. 10

TRENCHING EQUIPMENT WITH HINGED SIDE PLATES

BACKGROUND OF THE INVENTION

This invention generally relates to the field of mobile equipment for digging trenches.

In construction and landscaping work it is frequently necessary to dig trenches with walls at angles which vary from the vertical, and many times it is desirable to form a trench wherein each of the side walls thereof are at different angles from the vertical. While there are many prior art devices form trenches with angled side walls, many are inconvenient to use and, none provide any capability of varying the angle to suit the particular needs of a situation. Typical prior art devices for forming trenches with inclined side walls are shown in the following references:

U.S. Pat. No. 2,480,656 (Jenne),
U.S. Pat. No. 2,972,425 (Anderson, et al.),
U.S. Pat. No. 3,003,264 (Shore),
U.S. Pat. No. 3,792,539 (Clark).

In the Jenne, Shore and Clark references the side walls of the trench are formed by a blade or wing which are attached to the front or leading edge of a backhoe or drag line bucket. In the Anderson, et al. reference the bucket is provided with fixed, angled sides which form the sloping walls of a trench. None of the described devices are provided with means to adjust the angle of the side plate of the bucket.

Other references relating to backhoes or drag line buckets for forming trenches which may be of interest are U.S. Pat. No. 3,089,261 (Flath) and U.S. Pat. No. 3,286,377 (Long) which describe wing-like devices attached to the vertical side walls of the bucket to change the cross-sectional shape of the trench. However, no attempt is made to change the angle of the side wall.

For other prior art devices showing a scraping type action for the removal of dirt and the like, reference is made to the following references:

U.S. Pat. No. 2,261,874 (Cundiff),
U.S. Pat. No. 2,556,592 (Markkula),
U.S. Pat. No. 2,662,311 (Chattin),
U.S. Pat. No. 2,673,409 (Briscoe),
U.S. Pat. No. 2,856,709 (Brockly).
U.S. Pat. No. 3,526,047 (Roessler, et al.)

These references primarily are directed to devices having blades which scrape or plow the ground. They do not involve a trench forming type of bucket.

From the above, it is clear that the need remains for a bucket for a trenching device which can form trenches with walls of varying slope and, particularly, a device which can readily vary the slope to meet the particular job requirements without significant modifications to the bucket or the need to replace buckets for particular angled walls. The present invention satisfies this need.

SUMMARY OF THE INVENTION

This invention relates to an improvement in trench-forming equipment such as backhoe tractors, drag lines and the like and, particularly, to buckets for such trenching equipment in which the side plates can be adjusted to form trenches with walls having varying slopes.

In accordance with the present invention an open top bucket is provided with adjustable side plates which are hinged so that the angle of the side plates with respect

to the vertical can be readily changed by pivoting the side plates about the axis of the hinged connection. Where the trench is to have a V-shaped cross-section the side plates are hingedly connected together along their lower edge. In those situations where the cross-sectional shape of the trench is to be trapezoidal, the bucket is provided with a floor plate and the side plates of the bucket are hingedly connected along the edges of the floor plate. The bucket is provided with a back wall which is preferably sectioned with the outer sections fixed to the trailing edge of the side plates and fan-shaped in order to form a continuous back wall notwithstanding the inclination of the side plates.

The bucket is provided with means to adjust the inclination of the side plates thereof and, preferably, individual jacks are provided for each side plate so that the angle of each can be separately adjusted as desired.

The backhoe or drag line having a bucket in accordance with the invention is operated in a conventional manner. The only difference is varying the angle of the side plates to form a trench having the desired shape. If desired, hydraulic control means can be provided to adjust the angle of the side plates and the hand controls for such control means may be conveniently provided along with the other operational controls in the operator's console for the backhoe or drag line so that the angle of the side wall can be adjusted as necessary by the operator during the formation of the trench without dismounting from the vehicle.

These and other advantages of the invention will become apparent from the following detailed description when taken in conjunction with the accompanying exemplary drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of an embodiment of the invention which is designed for forming V-shaped trenches.

FIG. **2** is a rear view of the bucket shown in FIG. **1**.

FIG. **3** is a side view in section taken along the lines of **3—3** shown in FIG. **2**.

FIG. **4** is a sectional view of the back wall of the bucket taken along the lines **4—4** shown in FIG. **2**.

FIG. **5** is a sectional view of the center portion of the bucket taken along the lines of **5—5** shown in FIG. **3**.

FIG. **6** is a plan view, partially in section, of the bucket taken along the lines of **6—6** shown in FIG. **2**.

FIGS. **7** and **8** illustrate the cross-sectional shape of trenches formed with the bucket shown in FIGS. **1–6**.

FIGS. **9** and **10** are respectively front and rear views of a modified bucket provided with a floor plate.

FIGS. **11** and **12** illustrate the cross-sectional shape of trenches formed with the bucket shown in FIGS. **9** and **10**.

DETAILED DESCRIPTION OF THE INVENTION

Reference is made to FIGS. **1–6** which illustrate a bucket **10** embodying features of the invention. As is shown in these drawings, the bucket **10** is pivotally connected to the end of a boom or, more specifically, the dipper stick **11** (shown in phantom in FIG. **1**) of a tractor-mounted backhoe (not shown) or other similar trenching equipment. The pivotal connection with bucket **10** is made by means of a yoke **12** and a pin **13** which passes between the upstanding ears **14** and **15** of the yoke **12** and the end of the dipper stick **11**. The

bucket **10** is rotated about the axis of the pin **13** by means of an operating rod **16** which is pivotally connected by pin **17** to the upstanding ear **18** mounted on the upper member or hanger base plate **20** of the support frame **21**. The rod **17** is the operative element of a fluid actuated cylinder (not shown) which forms part of the operative mechanism of the backhoe.

The bucket **10** generally comprises a pair of matching side plates **22**, which are pivotally connected along the mating edges thereof by means of a hinge **23**, a sectioned back wall **24** and a support frame **21** which includes the hanger base plate **20**, struts **25** and **26**, a hinge bar **27**, and a pair of jack elements **28** which are utilized to adjust the orientation of the side plates **22** about the axis of the hinge **33**. The jack elements **28** generally comprise a female member **30** which is pivotally connected by means of bracket **31** and pin **32** to the inside surface of the side plate **22**, and a male member **33**, internally mounted to female member and threaded on the exterior thereof, which is pivotally connected to the end of the yoke **12** by means of a bracket **34** and a pin **35**. A threaded collar **36** with a handle is provided for adjusting the movement of the male member **33** with respect to the female member **30** to thereby adjust the orientation of the side plate **22** about the axis of the hinge **23**.

The back wall **24** of the bucket **10** is sectioned and, preferably each of the sections overlap and are fan-shaped so that the wall remains continuous, notwithstanding the occluded angle between the side plates **22**. As shown in FIG. **2**, each of the outside sections **40** are fixed to or are integrally formed with the adjacent side plates **32** and are adapted to move therewith. A center fan-shaped section **41** is stationary and fixed to the rear strut **26** of support frame **21** by suitable means, such as by welding. As shown in FIGS. **2**, **3** and **4**, finger guide elements **42** are provided on the back surface of stationary section **41** to support and guide the movable back wall sections **40** in the various positions thereof occasioned by the orientations of the side plates **22** which are caused by adjustments of the jack elements **28**.

A plow or nose element **43**, which is centrally positioned at the front or leading edge of the bucket **10**, is mounted by bolts **44** to the hinge bar **27** to aid in keeping the bucket **10** on track during use.

FIGS. **3**, **5** and **6** illustrate in detail the structure of the hinge **23** which generally comprises two interfitting leaf sections **45** and **46** having mounting flanges **47** and **48**, respectively. The side plates may be affixed to the flanges **47** and **48** in any desired fashion, such as by welding or bolting as shown in FIG. **6**. The leaf sections **45** and **46** are formed with interfitting barrel segments **49** and **50**, respectively, which facilitate the insertion of the hinge pin **51** which holds the leaf sections together and allows the rotation of the leaf sections about the hinge axis. One or more of barrel segments **49** and **50** may be welded to the hinge bar **27** as shown in FIGS. **3** and **5**.

The leading edge **55** of the bucket, as viewed in top plan view in FIGS. **1** and **6**, is generally tapered outwardly and rearwardly into a spade-like configuration to facilitate digging into the ground during the use of the bucket. If desired, separate cutting blades with teeth may be fixed to this leading edge to protect the edge **55** from wear and to facilitate digging into the ground.

FIGS. **9** and **10** illustrate the front and rear views, respectively, of a modified bucket **60** which has a floor plate **61**. The side plates **22** are hingedly connected along the outer edges of floor plate **61** by means of hinges **62** which are mounted to hinge bars **63**. The support frame **64** of this particular embodiment has two depending components **65** which are similar to the single support frame **21** of the first described embodiment. Each of the depending components **65** is provided with a forward strut **66**, a rear strut **67** and a hinge bar **63** to which the hinges **62** are connected. However, only one hanger base plate **68** is utilized and both forward struts **66** and rear struts **67** are welded or otherwise connected thereto. The yoke **12** and the upstanding ear **18** are fixed to the upper surface of the hanger base plate **68**. The modified bucket **68** is pivotally connected to the rear of a dipper stick **11** and the operating rod **16** by means of the yoke **12** and ear **16** as described for the first embodiment. The back wall is sectioned, as shown, with the two fan-shaped outer sections **69** fixed to or formed integral with the ends of the adjacent side plates **22** and overlap the stationary, fan-shaped section **20** secured to the support frame **64**. The outside sections **69** move with the side plates **22** when the orientation thereof is adjusted by jacks **28**.

The bucket in accordance with the invention can be easily adjusted to form a trench having a wide variety of angled sides as shown in FIGS. **7** and **8** and **11** and **12**. As indicated in FIG. **11**, the trenches formed by the bucket of the invention need not be symmetrical around a vertical center line. The side plates **22** may be individually adjusted to provide the desired orientation for each wall of the trench formed. Other modifications to the invention can be made without departing from the scope thereof.

What is claimed is:

1. An open top excavation bucket for forming trenches, comprising:

a. a support frame;

b. a pair of side plates hingedly connected along the lower edges thereof and supported from the support frame so that each of the side plates may be rotated about the axis of its hinge connection;

c. a back wall;

d. means connected to the side plates to adjust the orientation thereof about the axis of the hinge connection.

2. The excavation bucket of claim **1**, wherein the back wall is provided with overlapping sections.

3. The excavation bucket of claim **2**, wherein overlapping sections of the back wall are fan-shaped.

4. The excavation bucket of claim **1**, wherein the support frame comprises a hanger base plate, one or more struts depending from the hanger base plate and a hinge bar fixed to the lower portion of the one or more struts.

5. The excavation bucket of claim **4**, wherein the support frame is provided with a yoke fixed to the hanger base plate to facilitate the pivotal mounting of the excavation bucket to the end of a dipper stick.

6. The excavation bucket of claim **5**, wherein at least one upstanding ear is fixed to the hanger base plate to facilitate the connection thereto of an operating rod of a fluid actuated cylinder to pivot the bucket about the axis of the pivotal mounting of the yoke to the end of the dipper stick.

7. The excavation bucket of claim **1**, wherein jacking means are provided connecting each of the side plates to the support frame to facilitate adjustment of the orientation of the side plates about the axis of the hinge

connection by adjusting the length of the jacking means.

8. The excavation bucket of claim 7, wherein the jacking means comprises a female member and an externally threaded male member connected within the female member, said jacking means being pivotally connected at one end thereof to the support frame and the other end thereof to a side plate, and provided with rotational means on the male member to adjust the length of the jacking means and to thereby vary the orientation of the side plate connected thereto about the hinge connection.

9. An open top excavation bucket for forming trenches, comprising:

a. support frame;

b. a floor plate affixed to said support frame;

c. a pair of side plates hingedly connected along their lower edges to the outer edges of said floor plates by means of hinges affixed to such support frame or said floor plate;

d. a back wall; and

e. means connected to the side plates to adjust the orientation thereof about the axis of the hinge connection.

* * * * *